9 SUPPLEMENTARY PRODUCTS

9.1 Collaborative Convective Forecast Product (CCFP)

The Collaborative Convective Forecast Product (CCFP) is a graphical representation of forecast convective occurrence verifying at 2-, 4 -, and 6-hours after issuance time (Figure 9-1). Convection, for the purposes of the CCFP forecast, is defined as a polygon of at least 3,000 square miles containing all of the following threshold criteria:

- A coverage of at least 25 percent of echoes with at least 40 dBZ composite reflectivity,
- A coverage of at least 25 percent of echoes with echo tops of FL250 or greater, and
- A forecaster confidence of at least 25 percent.

All three threshold criteria must be met for any area of convection 3,000 square miles or greater to be included in a CCFP forecast. This is defined as the minimum CCFP criteria. Any area of convection, which is forecasted to NOT meet all three of these criteria, is NOT included in a CCFP forecast.

The CCFP is intended to be used as a strategic planning tool for air traffic flow management. It aids in the reduction of air traffic delays, reroutes and cancellations due to significant convection. It is **not** intended to be used for tactical air traffic flow decisions, in the airport terminal environment, or for pilot weather briefing purposes. The graphical representation is subject to annual revision.

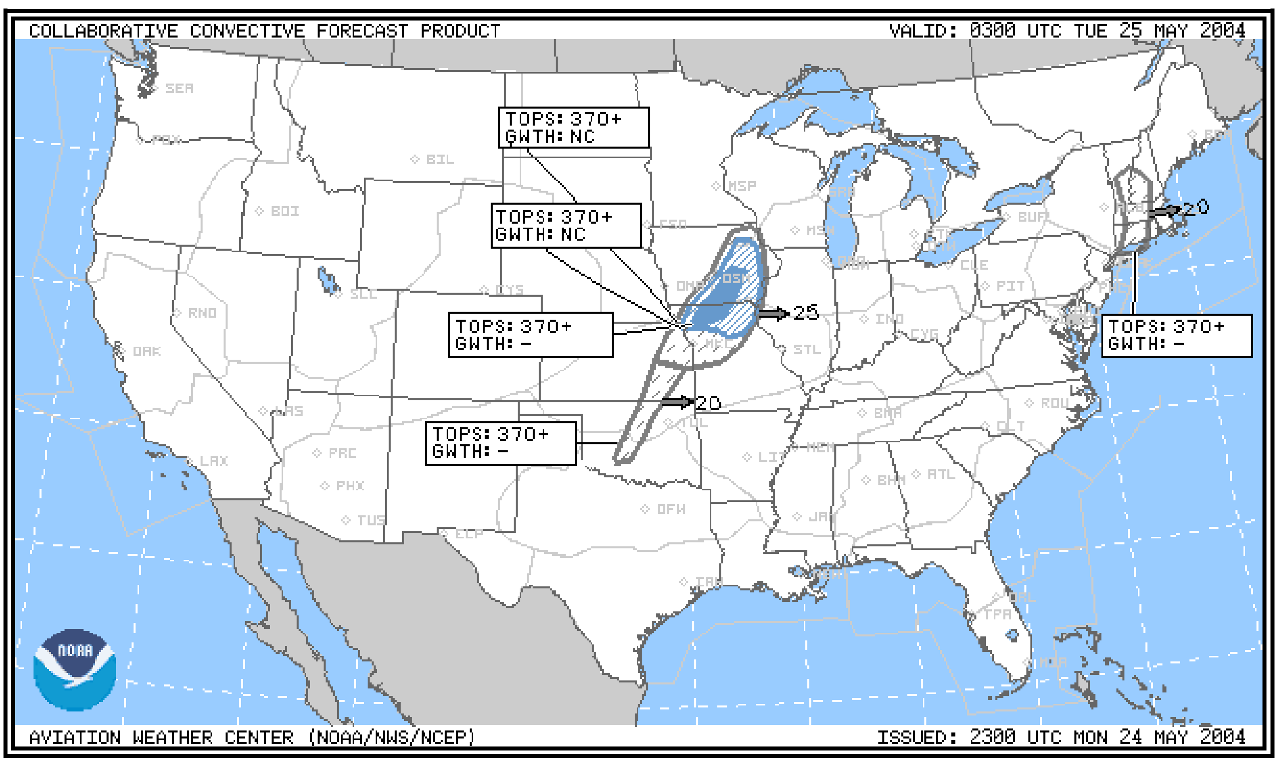

Figure 9-1. CCFP Example

9.1.1 Issuance

The CCFP is issued by the Aviation Weather Center (AWC) from March through October for the 48-contiguous states. Canadian forecasts are included on the product are available for southern Ontario and Quebec between April through September. This area is roughly from north of Wisconsin extending eastward to north of Maine.

The CCFP is issued every two hours, eleven times per day. Issuance times are from 08Z to 04Z during standard time and from 07Z to 03Z during daylight savings time. The product can be found on the AWC web page at http://aviationweather.gov/products/ccfp/.

9.1.2 Collaboration

The CCFP is produced from a collaborative effort between public and private meteorologists. The collaboration occurs between meteorologists from the Aviation Weather Center (AWC), Center Weather Service Units (CWSU), Meteorological Services of Canada (MSC), commercial airlines offices, and other private weather companies.

9.1.3 Content

Data graphically displayed on the CCFP consist of coverage of convection within a defined polygon, forecaster confidence of convective occurrence, and forecast movement of the convective areas. A data block also displays text information about coverage and confidence as well as forecast echo tops and convective growth information.

9.1.3.1 Coverage

The convective coverage within the forecast polygon is represented by the amount of fill within the polygon (Figure 9-2).

- Solid coverage, depicted by solid fill, means 75 to 100 percent of the polygon is forecast to contain convection.
- Medium coverage, defined by medium fill, indicates 40-74 percent of the polygon is forecast to contain convection.
- Sparse coverage, represented by sparse fill, means 25-39 percent of the polygon is forecast to contain convection.

A line of forecast convection, either within a forecast area or alone, is depicted by a solid purple line for solid (75 to 100 percent) or a dashed purple line for medium (40-74 percent) coverage. For a line of convection to be forecast, it must meet the flowing criteria:

- Its length must be at least 100 miles long,
- The width of the line must be 40NM wide, and
- For a solid line, greater than 75 percent of the line must be expected to contain convection. For a medium line, 40 to 74 percent of the must be expected to contain convection.

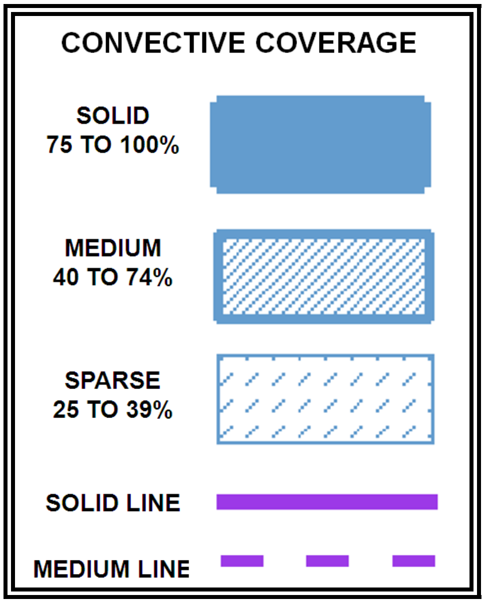

Figure 9-2. CCFP Forecast Convective Coverage

9.1.3.2 Confidence

Confidence represents the subjective opinion of the forecasters that the polygon will meet the minimum CCFP threshold criteria. The forecaster's confidence is represented by the color used to depict the polygon (Figure 9-3).

- A blue color represents high forecaster confidence (50-100 percent) the forecast convection will meet the minimum criteria.

- A gray color indicates low forecaster confidence (25-49 percent) the forecast convection will meet the minimum criteria.

Confidence is not to be associated with probability of occurrence.

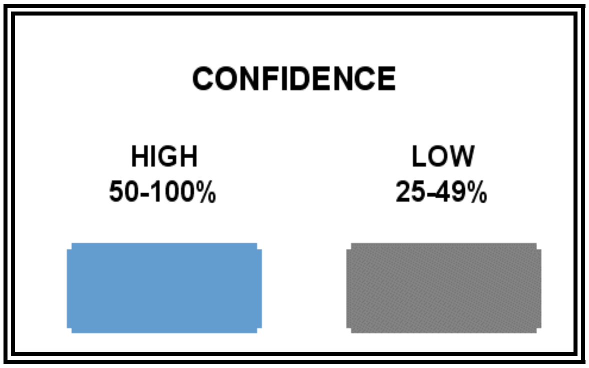

Figure 9-3. CCFP Forecast Confidence

9.1.3.3 Movement

Forecast movement for each polygon or line is indicated with a gray or blue arrow (Figure 9-4). The arrow points in the direction of forecast movement. A number at the tip of the arrow represents the speed in knots.

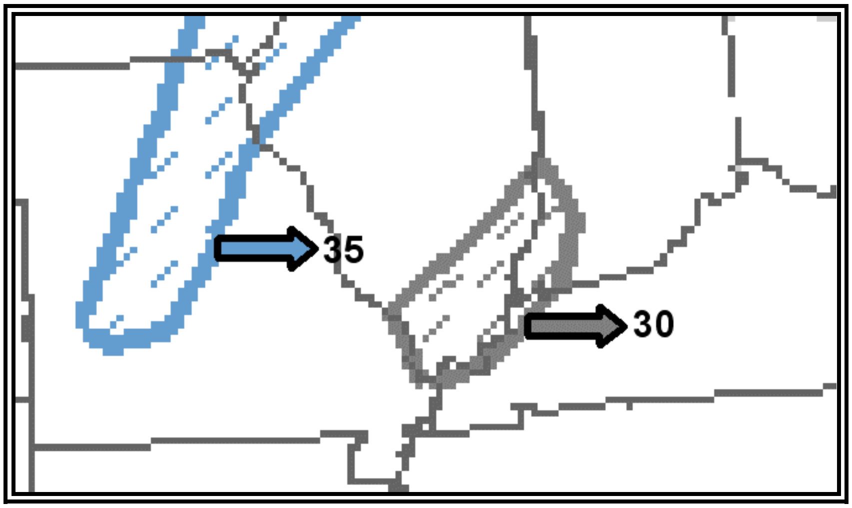

Figure 9-4. CCFP Forecast Convective Movement

9.1.3.4 Data Block

A data block is located adjacent to every polygon forecast (Figure 9-5 and Figure 9-6). A thin line connects the data block to the associated forecast area. Each data block contains information about forecast maximum echo tops (**TOPS**) and convective growth rates (**GWTH**).

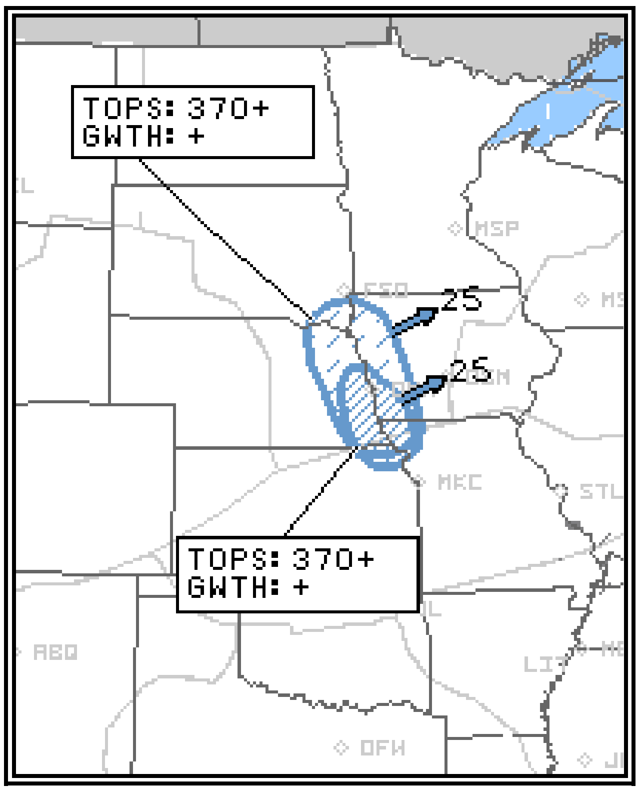

Figure 9-5. CCFP Data Block

TOPS: 370+
GWTH: +

Figure 9-6. CCFP Data Block Example

9.1.3.4.1 Tops

The word, **TOPS**, is used to depict the forecast maximum echo tops, in thousands of feet MSL, specified by four selected layers listed in Table 9-1. The heights of the forecast echo tops must cover at least 25 percent of the polygon. The exact location of the highest echo top within the polygon cannot be determined.

Table 9-1. CCFP Tops

FL250 – FL290	Flight level 250 to flight level 290
FL300 – FL340	Flight level 300 to flight level 340
FL350 - FL390	Flight level 350 to flight level 390
400+	Flight level 400 and higher

9.1.3.4.2 Growth

The contraction, **GWTH**, is used to depict the forecast average growth rate of the convection. The growth rate applies to both the height and areal coverage of the echoes (Table 9-2).

Table 9-2. CCFP Growth

+	Moderate positive growth
NC	No change in the growth
-	Negative Growth

9.1.3.4.3 Confidence

The contraction, **CONF,** depicted on the chart is the confidence the depicted polygon will meet the minimum CCFP criteria (Table 9-3).

Table 9-3. CCFP Confidence

LOW	25 to 49 percent
HIGH	50 to 100 percent

9.1.3.4.4 Coverage

The contraction, **CVRG**, is used to depict the forecast convective coverage within the polygon (Table 9-4). The coverage represents the percentage of the area forecast to be covered by convection.

Table 9-4. CCFP Coverage

25 – 39%	Sparse
40 – 74%	Medium
75 –100%	Solid

9.1.4 Strengths and Limitations

The primary strength of the CCFP is it relies on the vital collaborative efforts between several meteorological units in the private and public sector. The process helps produce the best possible convective forecast to assist in strategic air traffic decision-making.

The limitation of the CCFP is it does **not** include a forecast for all convection. If the convection does not meet the threshold criteria, it is not included in the CCFP. It is not intended to be used as a tactical short-term decision tool.

9.1.5 Use

The CCFP is to be used as a strategic planning tool for air traffic flow management in the 2- to 6-hour forecast period.

The product is not intended to be used as a pilot weather briefing tool.

9.2 National Convective Weather Forecast (NCWF)

The National Convective Weather Forecast (NCWF) is a near real-time, high resolution display of current and one-hour extrapolated forecasts of selected hazardous convective conditions for the conterminous United States. The NCWF is a supplement to, but does not substitute for, the report and forecast information contained within Convective SIGMETs. The NCWF is intended for use by general aviation, airline dispatchers, and Traffic Management Units.

9.2.1 Issuance

The NCWF is issued by the Aviation Weather Center (AWC) and is updated every five minutes. The product is available on the Aviation Digital Data Service (ADDS) web page at: http://adds.aviationweather.noaa.gov/convection/java/ and the AWC web site at: http://aviationweather.gov/products/ncwf/

9.2.2 Content

The NCWF displays current convective hazard fields, one-hour extrapolated forecast polygons, forecast speed and directions, and echo tops. Previous performance polygons can also be selected for display (Figure 9-7).

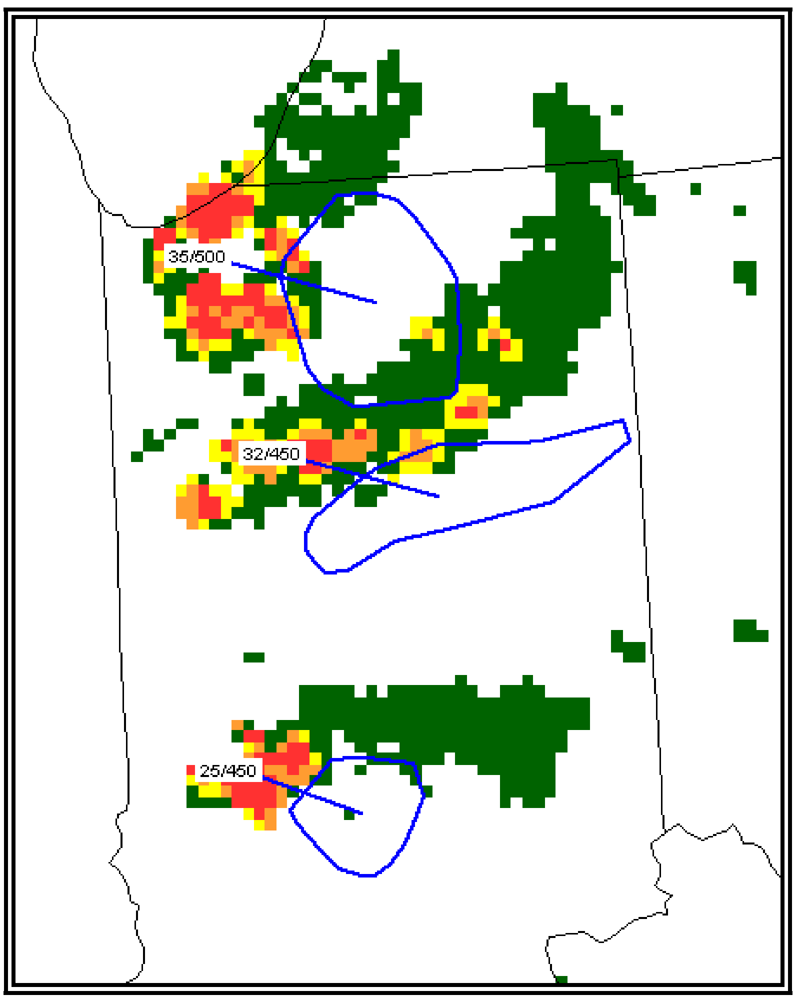

Figure 9-7. NCWF Example

9.2.2.1 Current Convective Hazard Fields

The current convective hazard field is a high-resolution display that identifies selected hazards associated with convective precipitation. The field is created from WSR-88D national reflectivity and echo-top mosaics and cloud-to-ground lightning data.

WSR-88D radar reflectivity data are filtered to identify locations having significant convective precipitation. Reflectivity data with echo tops of less than 17,000 feet MSL are eliminated from the data. This process removes ground clutter and anomalous propagation as well as significantly reduces the amount of stratiform (non-convective) precipitation from the data. Most stratiform precipitation tops are below 17,000 feet. The filter also removes shallow convection with tops below 17,000 feet. Shallow convection is often short-lived but can contain conditions hazardous to aviation and may be embedded in stratiform convection.

Frequencies of cloud-to-ground lightning are added to the filtered radar data to provide a more accurate picture of current hazardous convective conditions.

Current convective hazard fields are color coded according to the convective hazard scale for display on the NCWF (Figure 9-8).

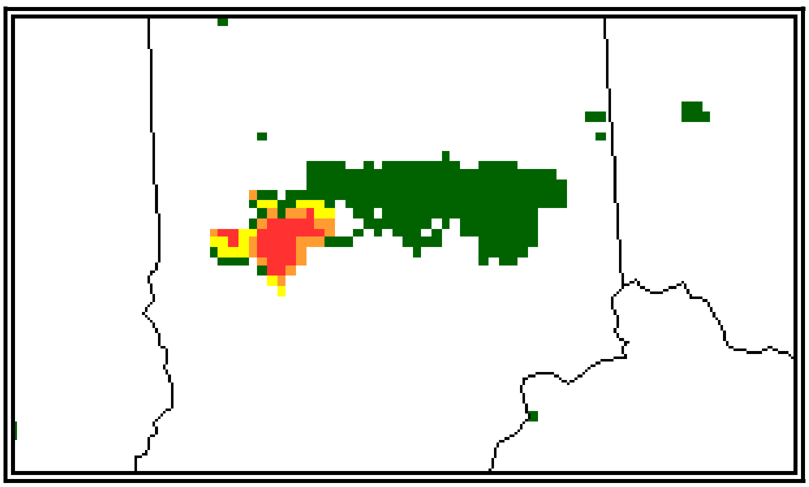

Figure 9-8. NCWF Current Convective Hazard Fields Example

9.2.2.1.1 Convective Hazard Field Scale

The convective hazard field scale uses six hazard levels (Figure 9-9) to characterize hazardous convection conditions.

The six hazard levels are determined by two factors:

- Intensities and maximum tops of WSR-88D reflectivity data, and
- Frequencies of cloud-to-ground lightning.

Higher hazard levels are associated with higher radar reflectivity intensities and higher frequencies of lightning strikes.

The six hazard levels are reduced to four-color codes for display on the NCWF. The relationships between the six hazard levels and four-color codes are summarized in Figure 9-9.

NCWF Hazard Scale		
Level	Color	Effect
6	RED	Thunderstorms may contain any or all
5	RED	of the following: severe turbulence, severe icing,
4	Orange	hail, frequent lightning, tornadoes, and low-level wind shear.
3	Yellow	The risk of hazardous weather generally increases
2	Green	with levels on the NCWF hazard scale
1	Green	

Figure 9-9. NCWF Hazard Scale

9.2.2.2 One-Hour Extrapolated Forecast Polygons

One-hour extrapolated forecast polygons are high-resolution polygons outlining areas expected to be filled by selected convective hazard fields in one hour. Extrapolated forecasts depict new locations for the convective hazard fields based on their past movements. Extrapolation forecasts do **not** forecast the development of new convective hazard conditions or the dissipation of existing conditions. Forecasts are provided **only** for convective hazard scale levels 3 or higher. The forecast polygons do not depict specific forecast hazard levels. On Figure 9-10, the light blue polygon denotes the location of the one-hour forecast convective hazard field.

9.2.2.3 Forecast Speed and Direction

Forecast speed and direction are assigned to current convective hazard fields having a one-hour extrapolated forecast. A line (or arrow on the AWC JavaScript product) is used to depict the direction of movement (Figure 9-10). The speed in knots is depicted by the first group of two numbers located near the current convective hazard field. The second group of three numbers identifies echo tops.

Forecast speed and direction is only updated every 10 minutes. The larger update time-interval (compared to five-minute updates for the NCWF) smoothes erratic forecast velocities. On Figure 9-10, the forecast direction (depicted by an arrow) is pointing to the southeast and the speed is 25 knots.

9.2.2.4 Echo Tops

Echo tops are assigned to current convective hazard fields having a one-hour extrapolated forecast. Echo tops are depicted by a group of three numbers located near the current convective hazard field and is plotted in hundreds of feet MSL (Figure 9-10). The first number of the group identifies forecast speed of movement. On Figure 9-10, the echo tops are 45,000 feet MSL.

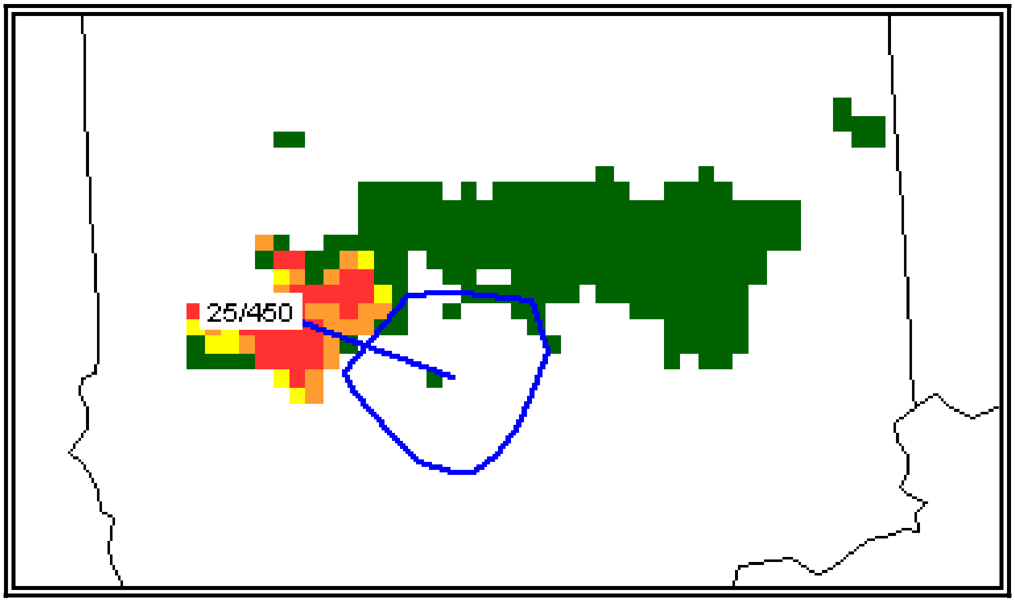

Figure 9-10. NCWF One-Hour Extrapolated Forecast Polygon, Forecast Movement Velocity, and Echo Tops Example

9.2.2.5 Previous Performance Polygons

Previous performance polygons are magenta polygons displaying the previous hour's extrapolated forecast polygons **with** the current convective hazard fields. A perfect forecast would have the polygons filled with convective hazard scale levels 3 or higher data. Levels 1 and 2 would be outside the polygons. The display of previous performance polygons allows the user to review the accuracy of the previous hour's forecast.

Figure 9-11 depicts current convective hazard fields and previous performance polygons (magenta) valid at 1500Z. The previous performance polygons are the one-hour extrapolated forecasts made at 1400Z. Although the polygons do not perfectly match the current level 3 and higher hazard fields, the forecasts are still fairly accurate.

Newly developed convective hazard levels 3 and higher do not have previous performance polygons. Extrapolated forecasts do not forecast developing hazardous convective.

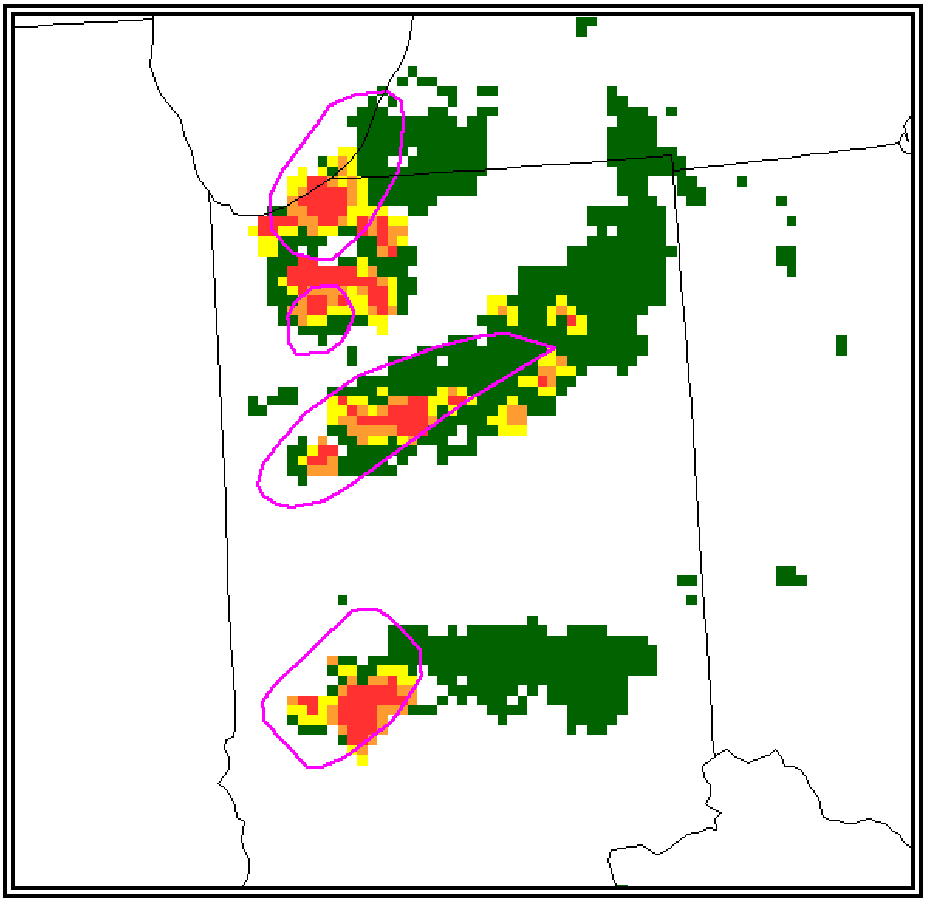

Figure 9-11. NCWF Previous Performance Polygons Example

9.2.3 The ADDS and AWC JAVA display

The ADDS web site allows for the display of all previously discussed attributes of the NCWF. This site also allows many overlay options including METARs, TAFs, VORs, ARTCC boundaries, counties, highways and rivers. Product animation is also possible on the AWC JavaScript image.

9.2.4 Strengths and Limitations

Strengths of the NCWF include:

- Convective hazard fields that agree very well with radar and lightning data,
- Updated every five minutes,
- High-resolution forecasts of convective hazards, and
- Long-lived convective precipitation is well forecast.

Limitations of the NCWF include:

- Initiation, growth, and decay of convective precipitation are not forecast,
- Short-lived or embedded convection may not be accurately displayed or forecast,

- Low-topped convection that contains little or no lightning may not be depicted,
- Erroneous motion vectors are occasionally assigned to storms, and
- Convective hazard field scales are not identified within the forecast polygons.

9.2.5 Uses of the NCWF

The purpose of the National Convective Weather Forecast (NCWF) is to produce a convective hazard field diagnostic and forecast product based on radar data, echo top mosaics, and lightning data. The target audience includes the FAA and other government agencies, pilots, airline dispatchers, aviation meteorologists, and other interested aviation users in the general public. The NCWF is a supplement to, but does not substitute for, the report and forecast information contained in Convective SIGMETs.

9.3 Current Icing Product (CIP)

The Current Icing Product (CIP) product combines sensor and numerical data to provide a hourly three-dimensional diagnosis of the icing environment. This information is displayed on a suite of twelve graphics which are available for the 48 contiguous United States, much of Canada and Mexico, and their respective coastal waters.

The CIP product suite is automatically produced with no human modifications. Information on the graphics is determined from observational data including WSR-88D radar, satellite, pilot weather reports, surface weather reports, lightning and computer model output.

FAA policy states the CIP is a supplementary weather product for enhanced situational awareness only and **must** be used with one or more primary products such as an AIRMET or SIGMET (see AIM 7-1-3).

9.3.1 Issuance

The CIP product suite is issued hourly 15 minutes after the hour by the Aviation Weather Center (AWC). The products are available through the Aviation Digital Data Service (ADDS) web site at: http://adds.aviationweather.noaa.gov/icing/icing_nav.php.
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9.3.2 Content

The CIP product suite consists of 10 graphics including:

- Icing Probability,
- Icing Probability Maximum (Max),
- Icing Severity,
- Icing Severity Max,
- Icing Severity – Probability > 25%,
- Icing Severity – Probability > 25% Max,
- Icing Severity – Probability > 50%,
- Icing Severity – Probability > 50% Max,
- Icing Severity plus Supercooled Large Droplets (SLD), and
- Icing Severity plus Supercooled Large Droplets (SLD) Max.

The CIP products are generated for individual altitudes from 1,000 feet MSL to Flight Level (FL) 300 at intervals of 1,000 feet.

The CIP Max products are a composite product which displays information about icing at **all** altitudes from 1,000 feet MSL to FL300. Single altitudes are referenced to MSL from the 1,000

to 17,000 feet and Flight Levels above 17,000 feet. The ADDS web site allows for access to every other altitude (1,000 FT, 3,000 FT, 5,000 FT, etc…). However, all altitudes can be accessed by use of the Flight Path Tool on the ADDS site.
Icing PIREPs are plotted on a single altitude graphic if the PIREP is within 1,000 feet of the selected altitude and has been observed within 75 minutes of the chart's valid time. On the CIP Max graphics, PIREPs for all altitudes (i.e. 1,000 feet MSL to FL300) are displayed. However, negative reports of icing are not plotted on the CIP Max products in an effort to reduce clutter. The PIREP legend is located on the bottom of each graphic.

9.3.2.1 Icing Probability

The Icing Probability product (Figure 9-12) displays, at a single altitude, the probability of icing. Probabilities range from 0% (no icing expected) to 85% or greater (nearly certain icing.)

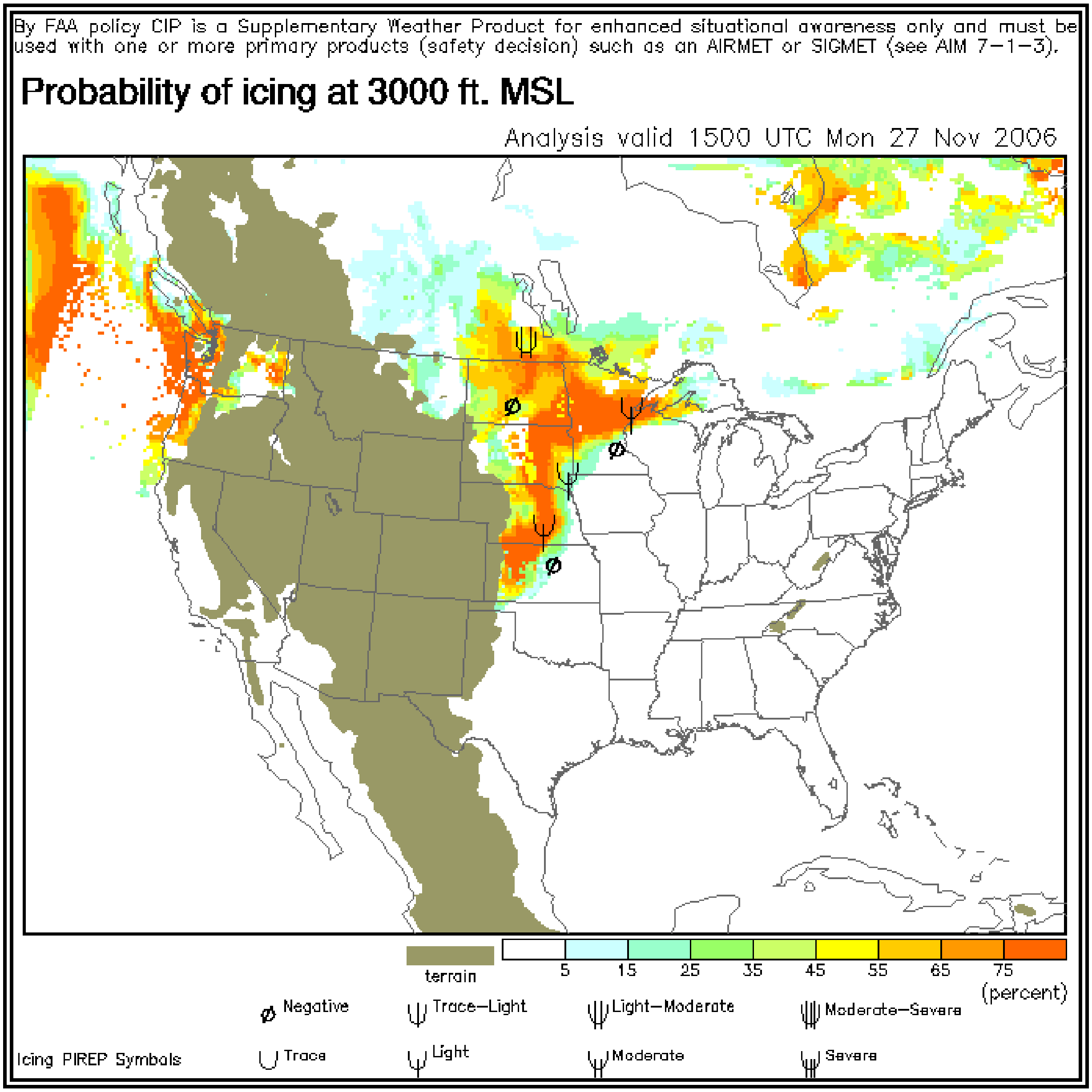

Figure 9-12. CIP Icing Probability (3,000 feet MSL) Example

"Cool" colors represent low probabilities and "warm" colors represent higher probabilities. Probabilities do not reach 100% because the data used to determine the probability of icing cannot diagnose, with absolute certainty, the presence of icing conditions at any location and altitude. White regions indicate that the probability of icing is zero. Brown regions indicate where higher-elevation terrain extends above the altitude of the particular graphic.

9.3.2.2 Icing Probability -- Maximum

The Icing Probability - Maximum graphic (Figure 9-13) displays the probability of icing at **all** altitudes from 1,000 feet MSL to FL300. Probabilities range from 0% (no icing expected) to 85% or greater (nearly certain icing.)

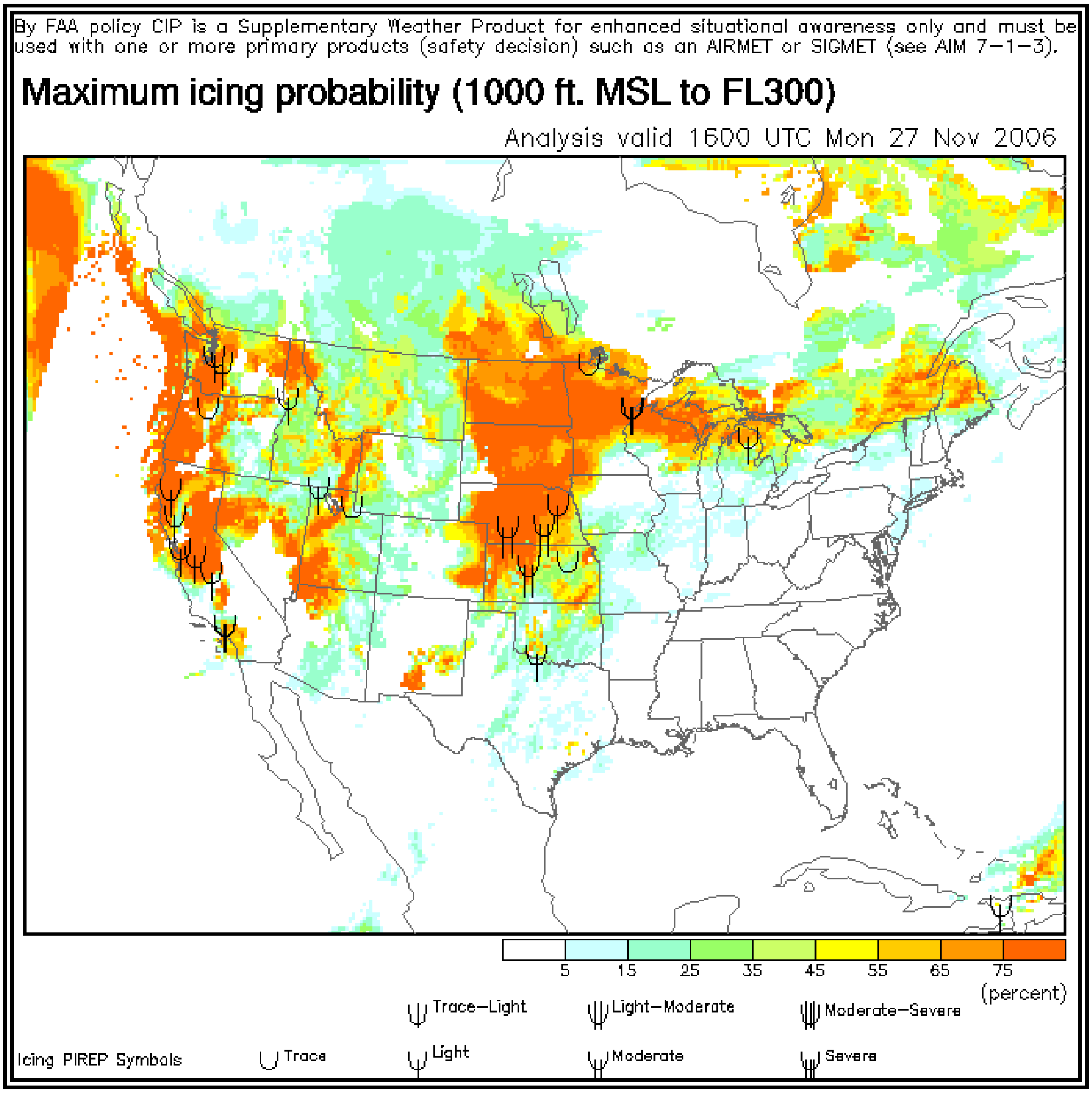

Figure 9-13. CIP Icing Probability – Max Example

"Cool" colors represent low probabilities and "warm" colors represent higher probabilities. Probabilities do not reach 100% because the data used to determine the probability of icing cannot diagnose, with absolute certainty, the presence of icing conditions at any location and altitude. White regions indicate the probability of icing is zero.

9.3.2.3 Icing Severity

The Icing Severity product (Figure 9-14) depicts, at a single altitude, the intensity of icing expected at locations where the Icing Probability product depicts possible icing. Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

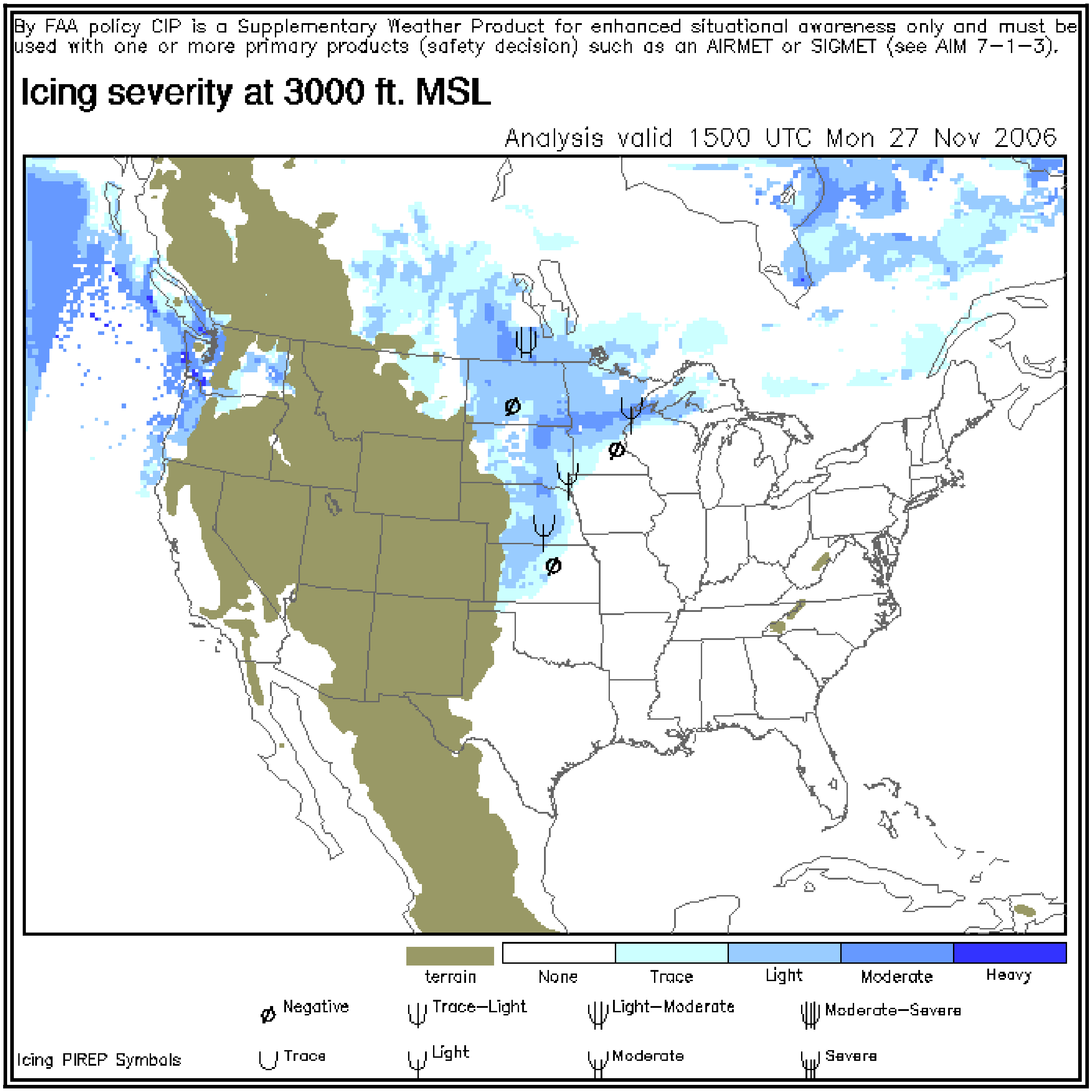

Figure 9-14. CIP Icing Severity (3,000 feet MSL) Example

The lightest blue color represents trace icing. As the blue-color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. Brown regions indicate where higher-elevation terrain extends above the altitude of the particular graphic.

9.3.2.4 Icing Severity -- Maximum

The Icing Severity - Maximum product (Figure 9-15) displays the intensity of icing at **all** altitudes from 1,000 feet MSL to FL300. Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

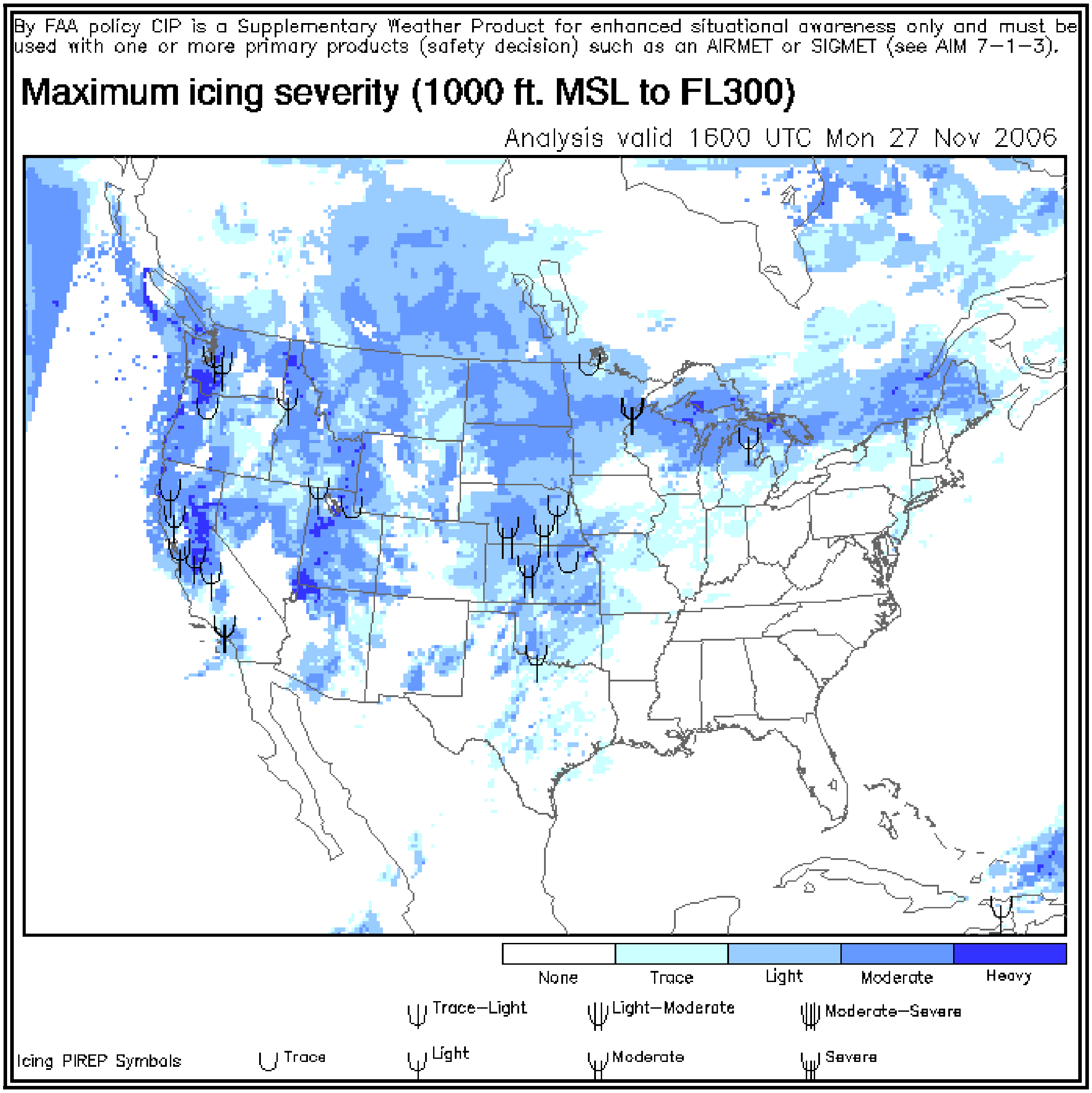

Figure 9-15. CIP Icing Severity – Max Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary.

9.3.2.5 Icing Severity – Probability > 25%

The Icing Severity – Probability > 25% product (Figure 9-16) depicts, at a single altitude, where a 26 to 100 percent probability exists for the indicated icing intensity. Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

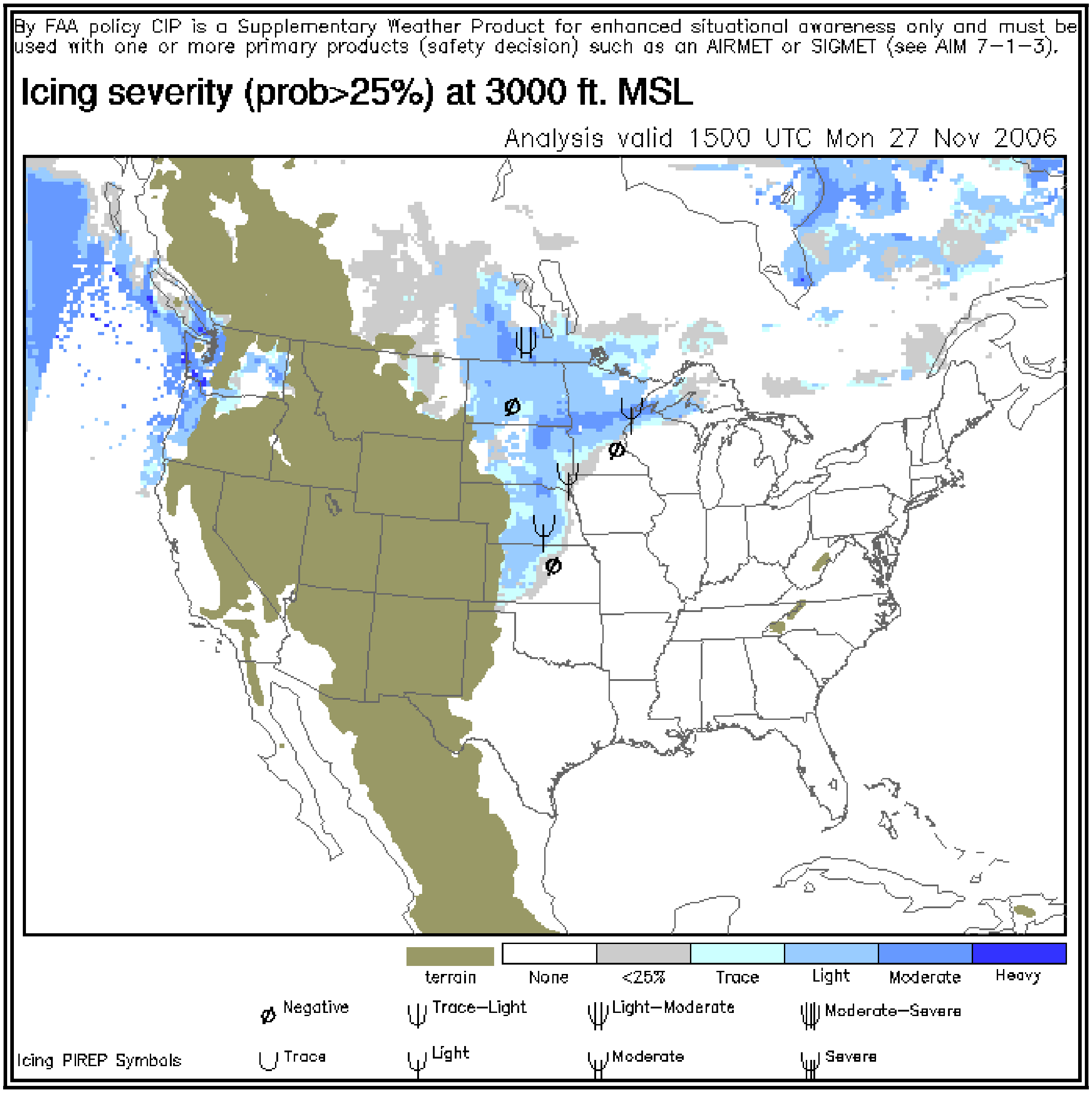

Figure 9-16. CIP Icing Severity Probability >25% Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. Brown regions indicate higher-elevation terrain extending above the altitude of the particular graphic. A gray color is used to mask the intensity pixels where the probability of icing is 25% or less.

9.3.2.6 Icing Severity – Probability > 25% - Maximum

The Icing Severity – Probability > 25% - Maximum product (Figure 9-17) depicts, at **all** altitudes from 1,000 feet MSL to FL300, where the probability of the indicated icing intensity is 26 to 100 percent. Icing intensity is displayed using icing intensity categories: trace, light, moderate, heavy.

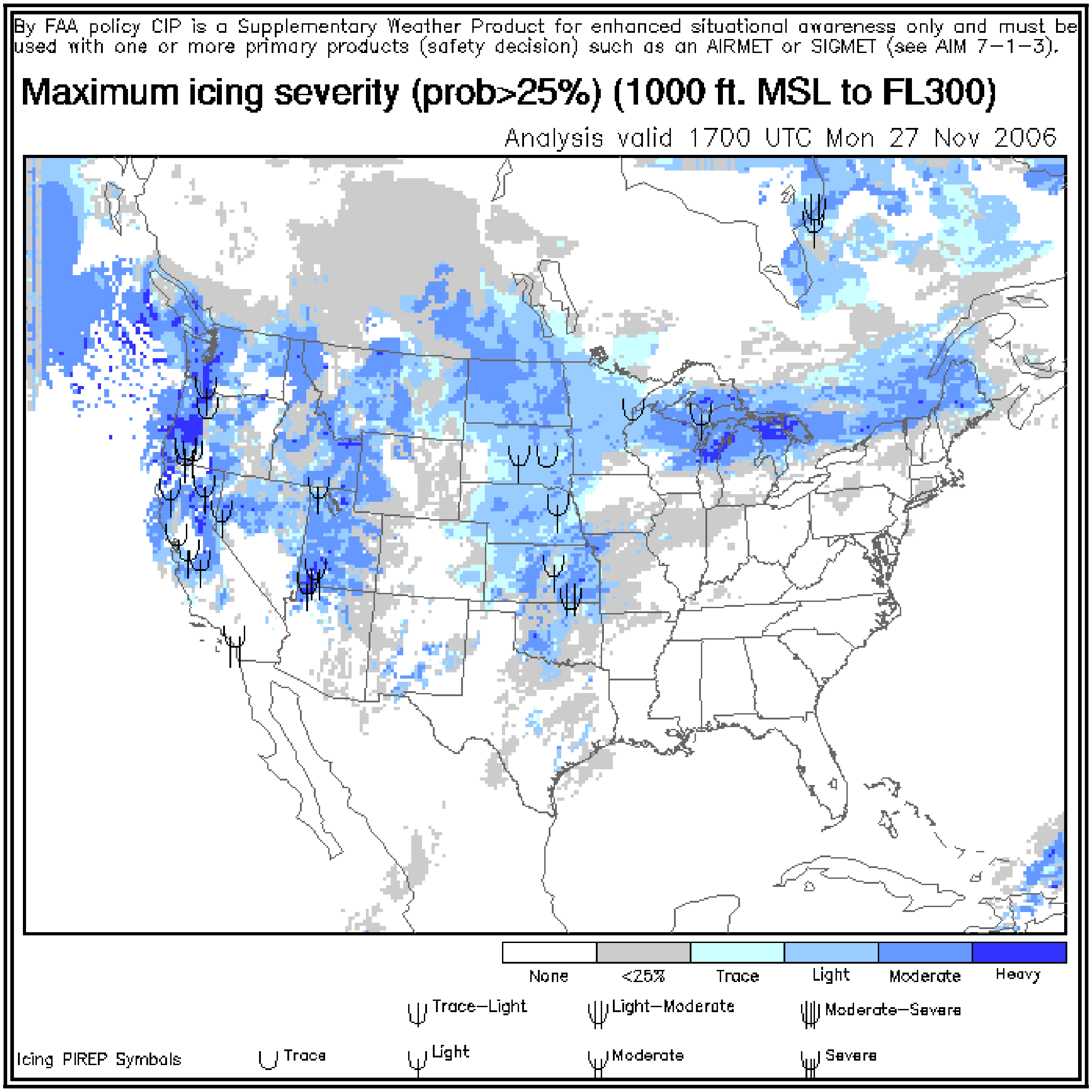

Figure 9-17. CIP Icing Severity Probability >25% Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. A gray color is used to mask the intensity pixels where the probability of icing is 25% or less.

9.3.2.7 Icing Severity – Probability > 50%

The Icing Severity – Probability > 50% product (Figure 9-18) depicts, at a single altitude, where the probability of the indicated icing intensity 51 to 100 percent. Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

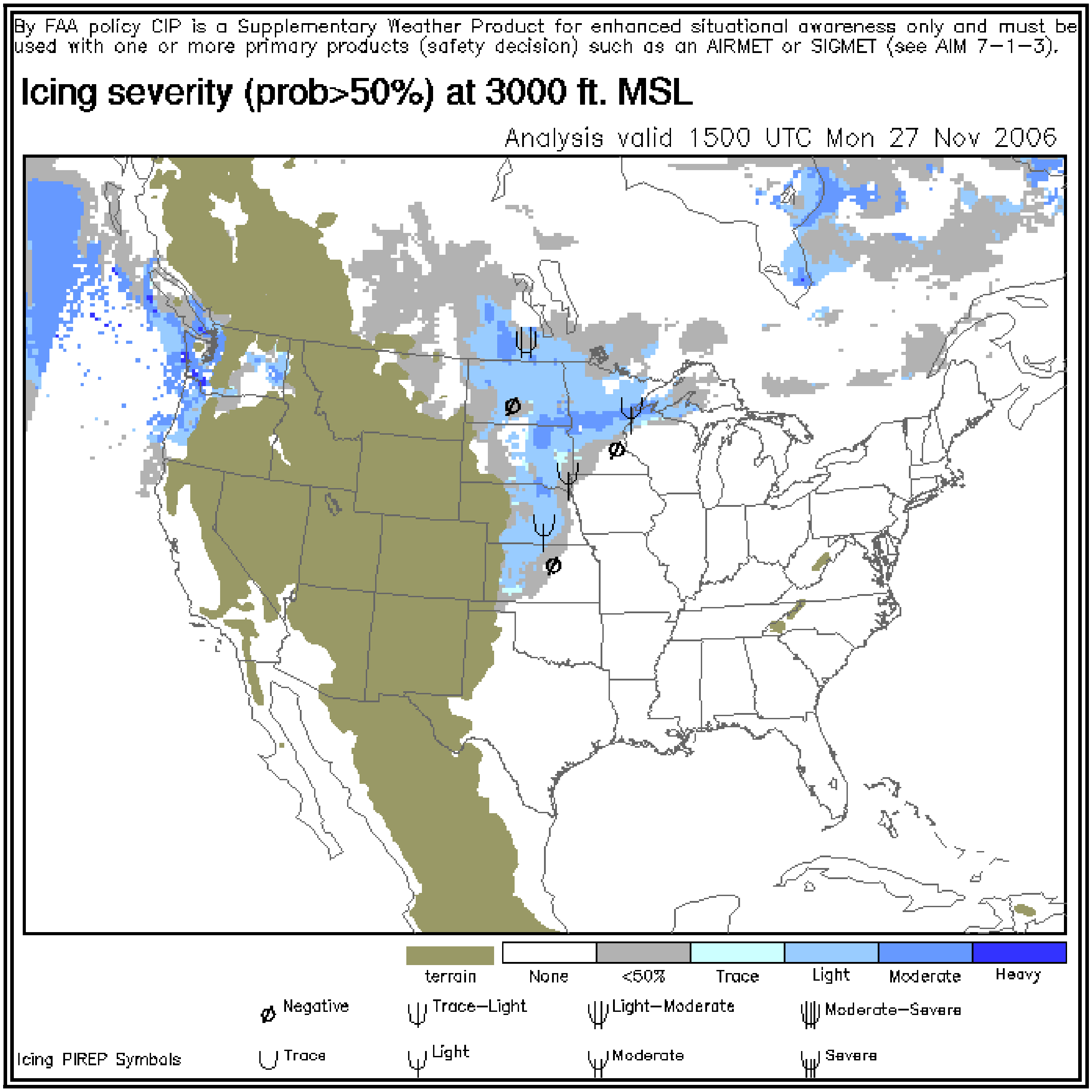

Figure 9-18. CIP Icing Severity Probability > 50% Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. Brown regions indicate where higher-elevation terrain extends above the altitude of the particular graphic. A gray color is used to mask the intensity pixels where the probability of icing is 50% or less.

9.3.2.8 Icing Severity – Probability > 50% - Maximum

The Icing Severity – Probability > 50% - Maximum product (Figure 9-19) depicts, at **all** altitudes from 1,000 feet MSL to FL300, where the probability of the indicated icing intensity is 51 to 100 percent. Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

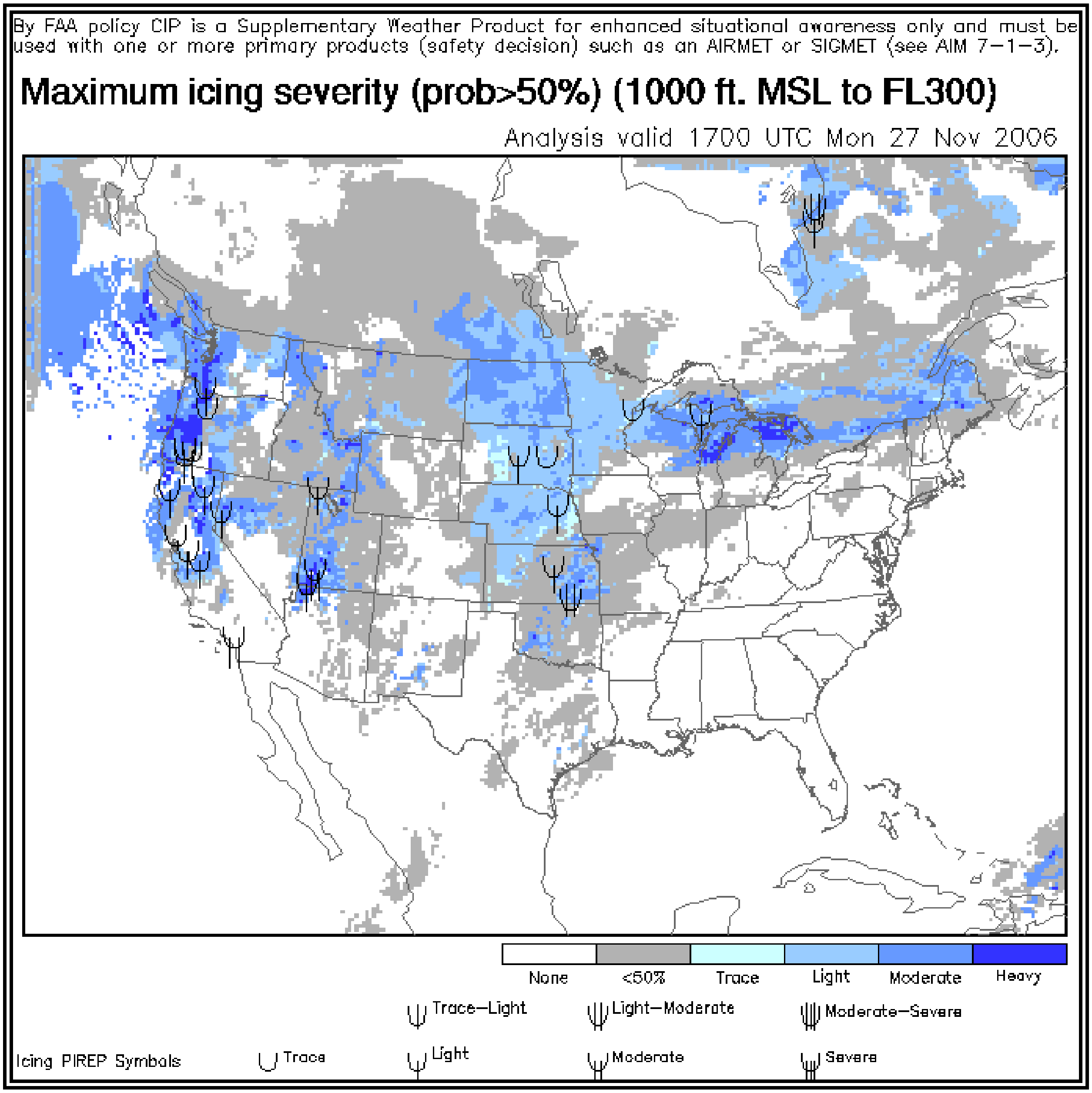

Figure 9-19. CIP Icing Severity Probability > 50% - Max Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. A gray color is used to mask the intensity pixels where the probability of icing is 50% or less.

9.3.2.9 Icing Severity plus Supercooled Large Droplets (SLD)

The Icing Severity plus Supercooled Large Droplets (SLD) product (Figure 9-20) depicts, at a single altitude, the intensity of icing expected as well as locations where a threat for SLD exists.

SLD is defined as supercooled water droplets larger than 50 micrometers in diameter. These size droplets include freezing drizzle and/or freezing rain aloft. SLD, which are outside the icing certification envelopes (FAR Part 25 Appendix C), can be particularly hazardous to some aircraft.

Icing intensity is displayed using icing intensity categories: trace, light, moderate and heavy.

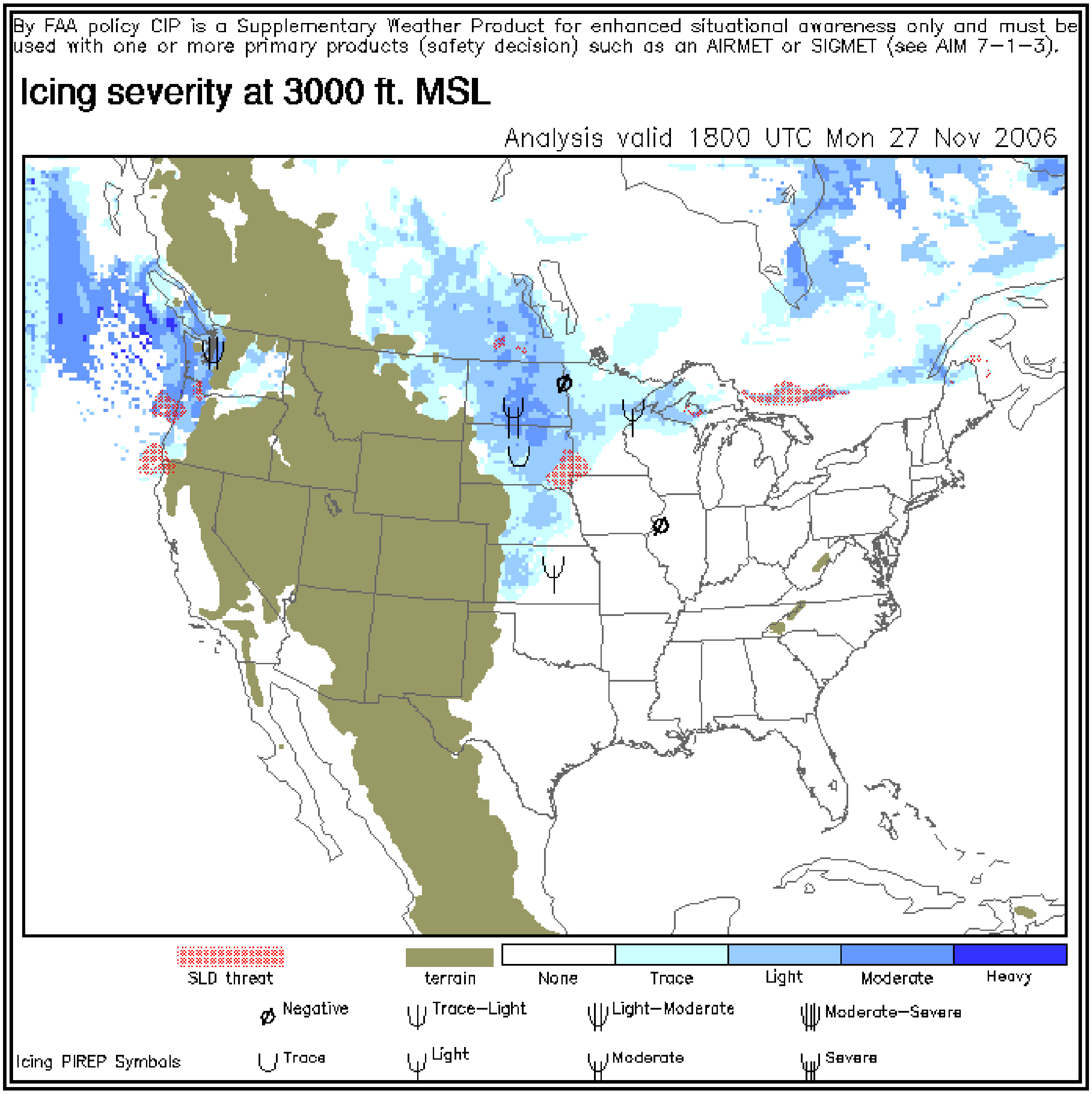

Figure 9-20. CIP Icing Severity plus Supercooled Large Droplets (SLD) Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. Brown regions indicate where higher-elevation terrain extends above the altitude of the particular graphic. Locations where a threat for SLD exists are depicted with red hatching.

9.3.2.10 Icing Severity plus Supercooled Large Droplets (SLD) - Maximum

The Icing Severity plus Supercooled Large Droplets (SLD) product (Figure 9-21) depicts at all altitudes, between 1,000 feet MSL and FL300, the intensity of icing expected as well as locations where a threat for SLD exists.

SLD is defined as supercooled water droplets larger than 50 micrometers in diameter. These size droplets include freezing drizzle and/or freezing rain aloft. SLD, which are outside the icing certification envelopes (FAR Part 25 Appendix C), can be particularly hazardous to some aircraft.

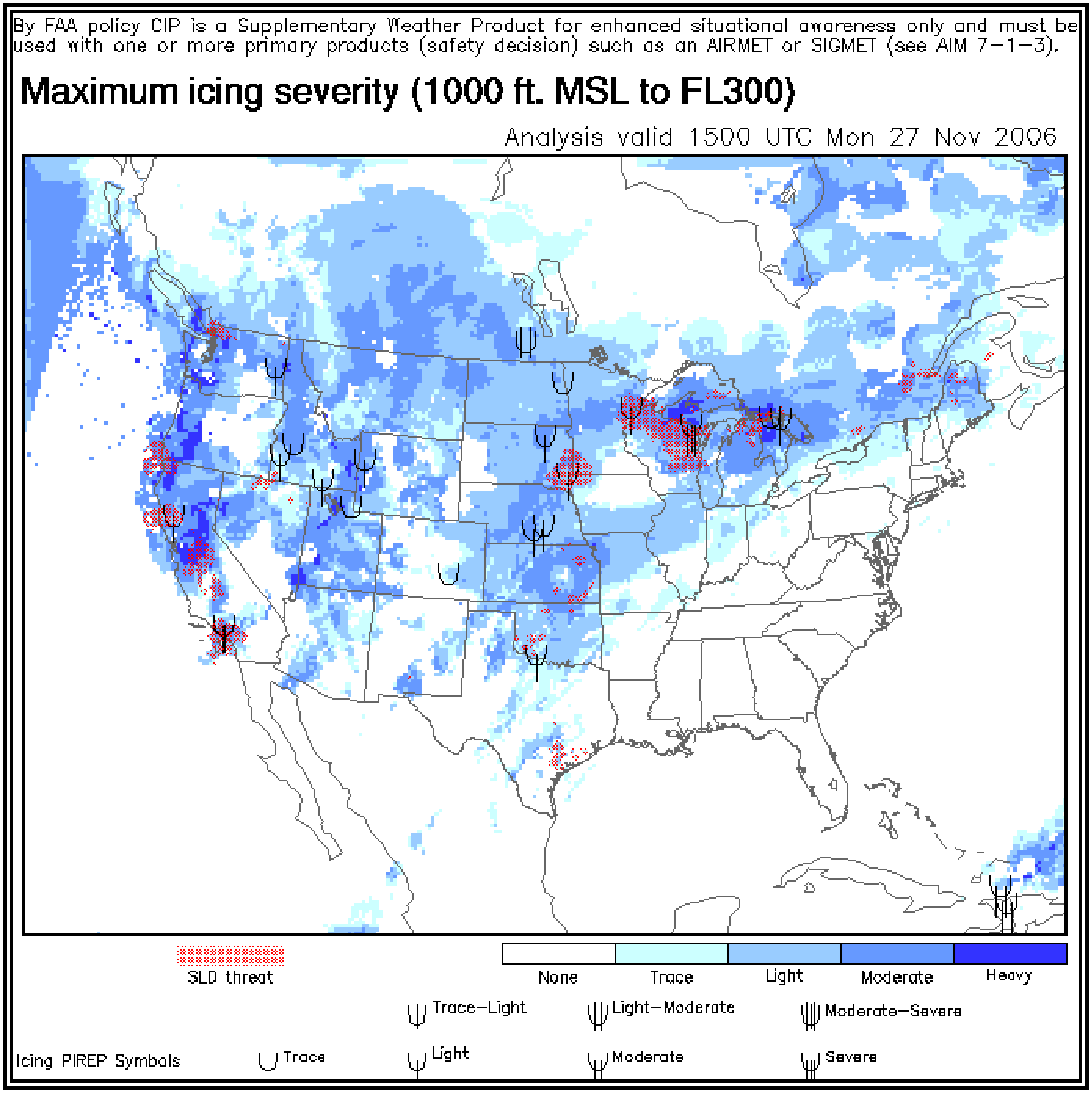

Figure 9-21. CIP Icing Severity plus Supercooled Large Droplets (SLD) – Max Example

The lightest blue color represents trace icing. As the blue color shades become darker, the icing intensity increases. The darkest blue color represents heavy icing. White regions indicate where no probability of icing exists and, therefore, no intensity is necessary. Locations where a threat for SLD exists are depicted with red hatching.

9.3.3 Strengths and Limitations

9.3.3.1 Strengths

The CIP product suite is updated hourly and provides a diagnostic tool to assist in determining the probability for icing, the intensity of icing and the threat for SLD.

9.3.3.2 Limitations

Actual icing severity may be different than what is depicted on the CIP graphics and plotted PIREPS because:

- Different aircraft types experience different severities of icing in the same atmospheric environments. Severity definitions are currently pilot-based and thus are a function of the aircraft type, flight phase (takeoff/landing, cruise, etc.), aircraft configuration, as well as the pilot's experience and perception of the icing hazard.

- Assessing the amount and drop size of supercooled liquid water (SLW) in the atmosphere is difficult.

- The Icing Severity products depict the severity of the meteorological icing environment and **not** the resultant icing that may occur on the aircraft.

9.3.4 Uses

The CIP Icing Probability product can be used to identify the current three-dimensional probability of icing.

The CIP Icing Severity product can be used to determine the intensity of icing. The CIP Icing Severity – Probability > 25% or Probability > 50% depicts the probability of a given intensity of icing occurring.

Finally the Icing Severity plus SLD product can help in determining the threat of SLD which is particularly hazardous to some aircraft.

Icing PIREPs are plotted on single altitude graphics if the PIREP is within 1,000 feet of the graphic's altitude and has been observed within 75 minutes of the chart's valid time. On CIP Max product, PIREPs for all altitudes (i.e. 1,000 feet MSL to FL300) are displayed. However, negative reports of icing are not plotted on the CIP Max product in an effort to reduce clutter. The PIREP legend is located on the bottom of each graphic.

9.4 Forecast Icing Potential (FIP)

The Forecast Icing Potential (FIP) provides a three-dimensional forecast of icing potential (or likelihood) using numerical weather prediction model output (Figure 9-17). The FIP product suite is automatically generated with no human modifications. It may be used as a higher resolution supplement to AIRMETs and SIGMETs but is **not** a substitute for them. It is authorized for operational use **only** by meteorologists and dispatchers. The forecast area covers the 48-contiguous states, much of Canada and Mexico and their respective coastal waters.

9.4.1 Issuance

The FIP is issued every hour and generates hourly forecast for 3 hours into the future. For example, forecasts issued at 1300Z would be valid for 1400Z, 1500Z and 1600Z. Six-, 9-, and 12-hour forecasts are issued every three hours beginning at 00Z. For example, a forecast suite issued at 0300Z would have valid times at 0900Z, 1200Z and 1500Z respectively. The product is issued by the Aviation Weather Center (AWC) and is available through the Aviation Digital Data Service (ADDS) web site at: http://adds.aviationweather.noaa.gov/icing/icing_nav.php.

9.4.2 Content

The FIP forecasts the likelihood of icing from super-cooled liquid water droplets. The likelihood field ranges from 0 (no icing) to 100 (icing likely). The scale depicts likelihood of icing using "cool" and "warm" colors, with warmer colors indicating a higher likelihood of icing. Regions depicted in white indicate zero icing potential according to the CIP. Brown regions indicate areas of terrain.

The scale is not calibrated as a true probability value. It does, however, have value in pointing out differences in the likelihood of encountering icing at a given location. For example, a value of 70 does not indicate there is a 70 percent chance of encountering icing. However, when comparing it to other higher or lower values will indicate if there is a greater or lesser likelihood of encountering icing. No information is provided as to the severity of icing and none should be inferred. FIP output is available for 1,000 foot vertical intervals. ADDS displays every third level except on the Flight Path Tool which provides access to all levels.

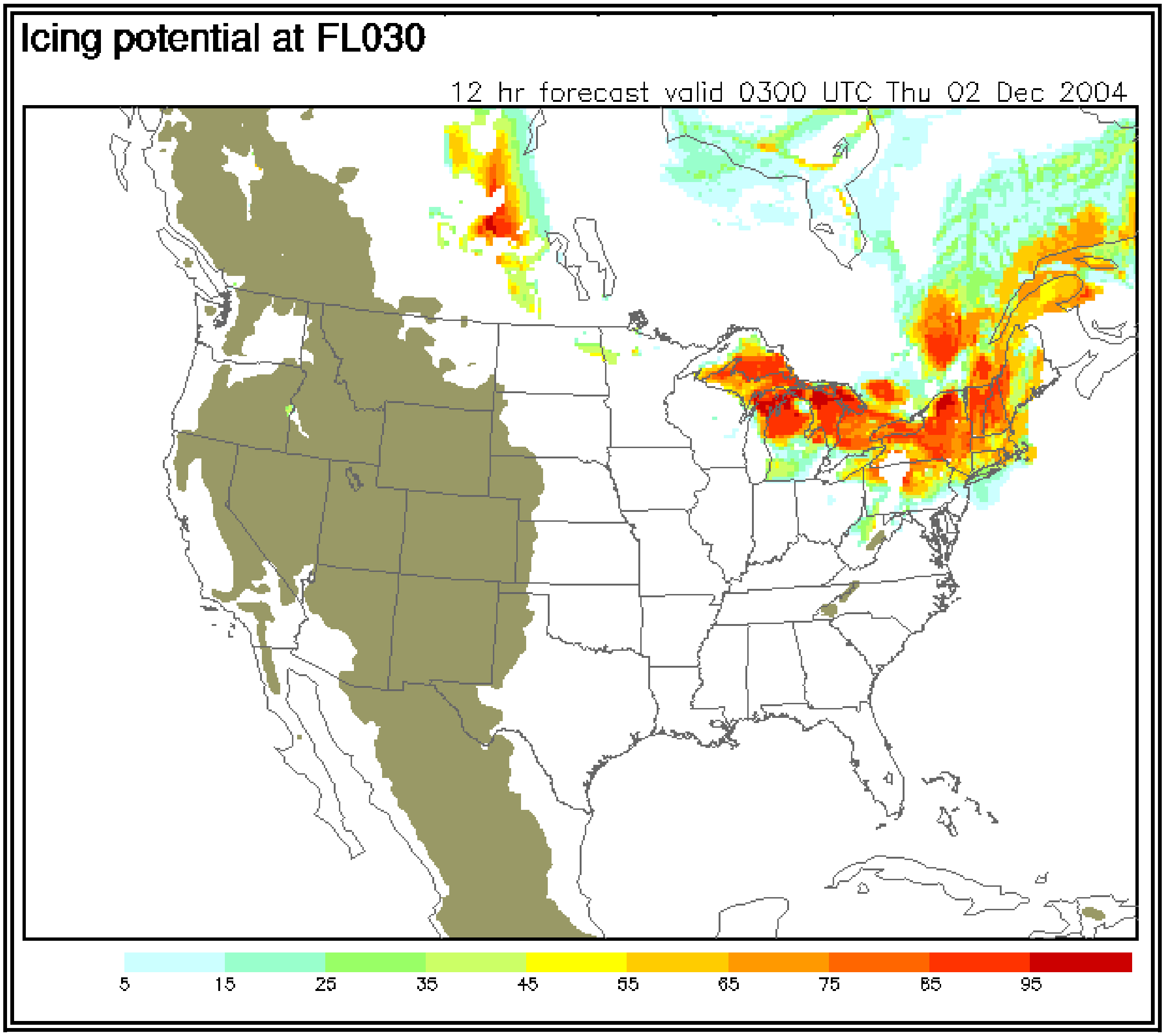

Figure 9-22. FIP Example

9.4.3 Strengths and Limitations

Strengths

- The FIP can be used to help determine the forecast for potential for icing through the entire vertical depth of the atmosphere.

- The product is updated hourly.

Limitations

- The product does not display any information about the severity of icing.

- The product only displays the forecast potential for icing, not the absolute probability.

- It is only approved for use by meteorologists and dispatchers.

- The product is generated without human modification. Therefore, the forecasts are only as accurate the computer model output used to create them.

9.4.4 Use

The FIP is primarily used to help determine the likelihood of icing at the specified forecast valid times.

9.5 Graphical Turbulence Guidance (GTG)

The Graphical Turbulence Guidance (GTG) product suite provides a three-dimensional diagnosis and forecast of Clear Air Turbulence (CAT) potential. The GTG is created using a combination of computer model output and turbulence observations. The GTG product suite, which consists of the GTG analysis and forecast and Composite analysis and forecast, is automatically generated with no human modifications. It may be used as a supplement to AIRMETs and SIGMETs but is **not** a substitute for them. It is authorized for operational use **only** by meteorologist and dispatchers. The GTG is available for the 48-contiguous states, much of Canada and Mexico and their respective coastal waters.

9.5.1 Issuance

The GTG analysis is issued hourly. The 3-, 6-, 9-, and 12-hour forecasts are issued every three hours beginning at 00Z. For example, a forecast suite issued at 0600Z would have valid times at 0900Z, 1200Z, 1500Z, and 1800Z respectively. The GTG Analysis and Forecasts, along with the Composite products, are issued by the Aviation Weather Center (AWC) and are available through the Aviation Digital Data Service (ADDS) web site at: http://adds.aviationweather.noaa.gov/turbulence/turb_nav.php.

9.5.2 Content

9.5.2.1 GTG Analysis and Forecast

The GTG Analysis and Forecast graphics depict the location and intensity of potential Clear Air Turbulence (CAT) (Figure 9-18). Standard intensity terminology is used. The GTG output is available for 1,000 foot vertical intervals between FL200 and FL450. ADDS turbulence page displays every third level starting at FL210 level, while the ADDS Flight Path Tool provides access to all levels.

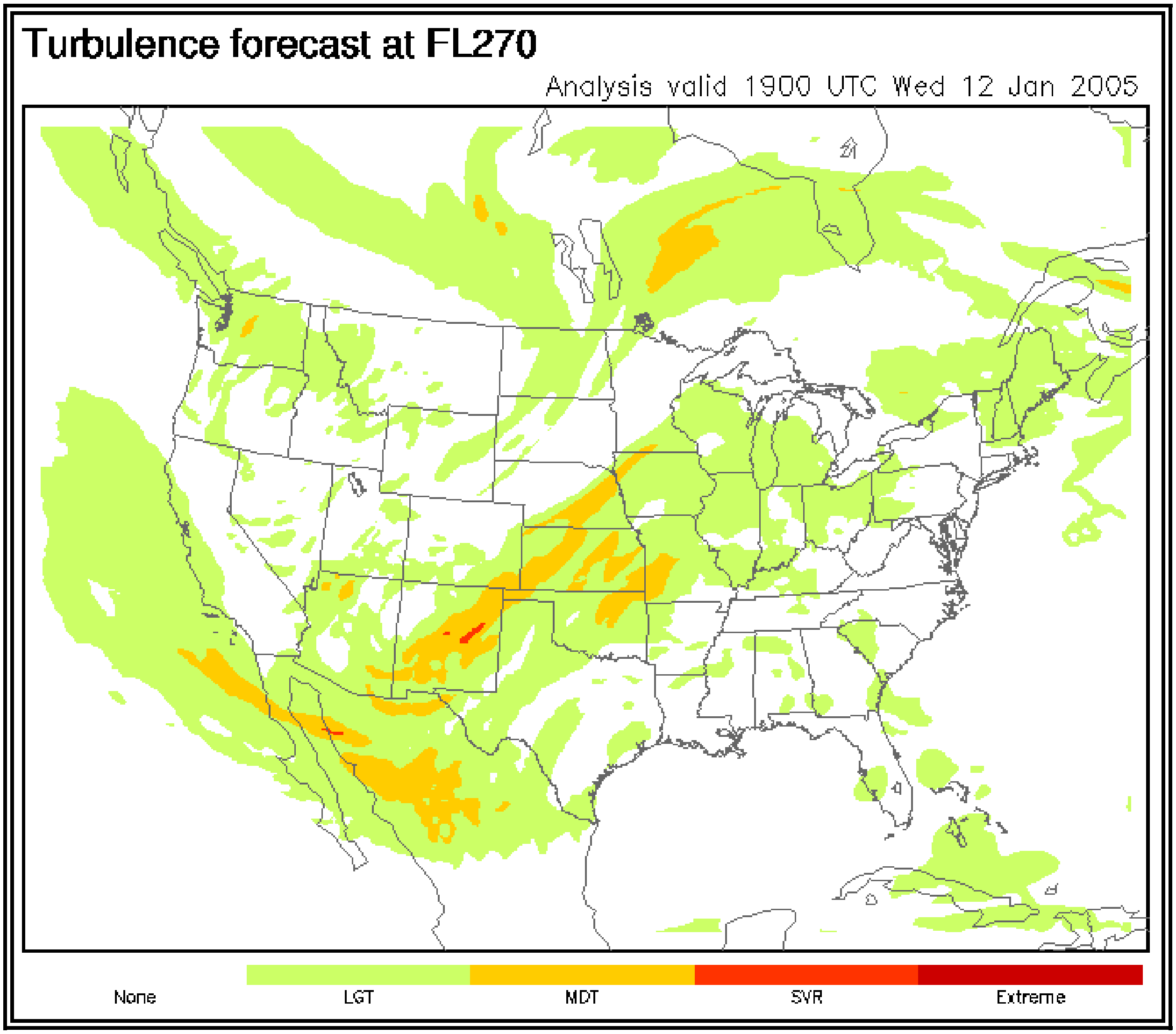

Figure 9-23. GTG Example

9.5.2.2 GTG Composite Analysis and Forecast

The GTG Composite products display the **maximum** intensity of potential turbulence between FL200 and FL450 (Figure 9-19). In other words, at any given location, the displayed value represents the maximum potential turbulence between FL200 and FL450. Single altitude graphics must be examined to determine the altitude of the potential turbulence.

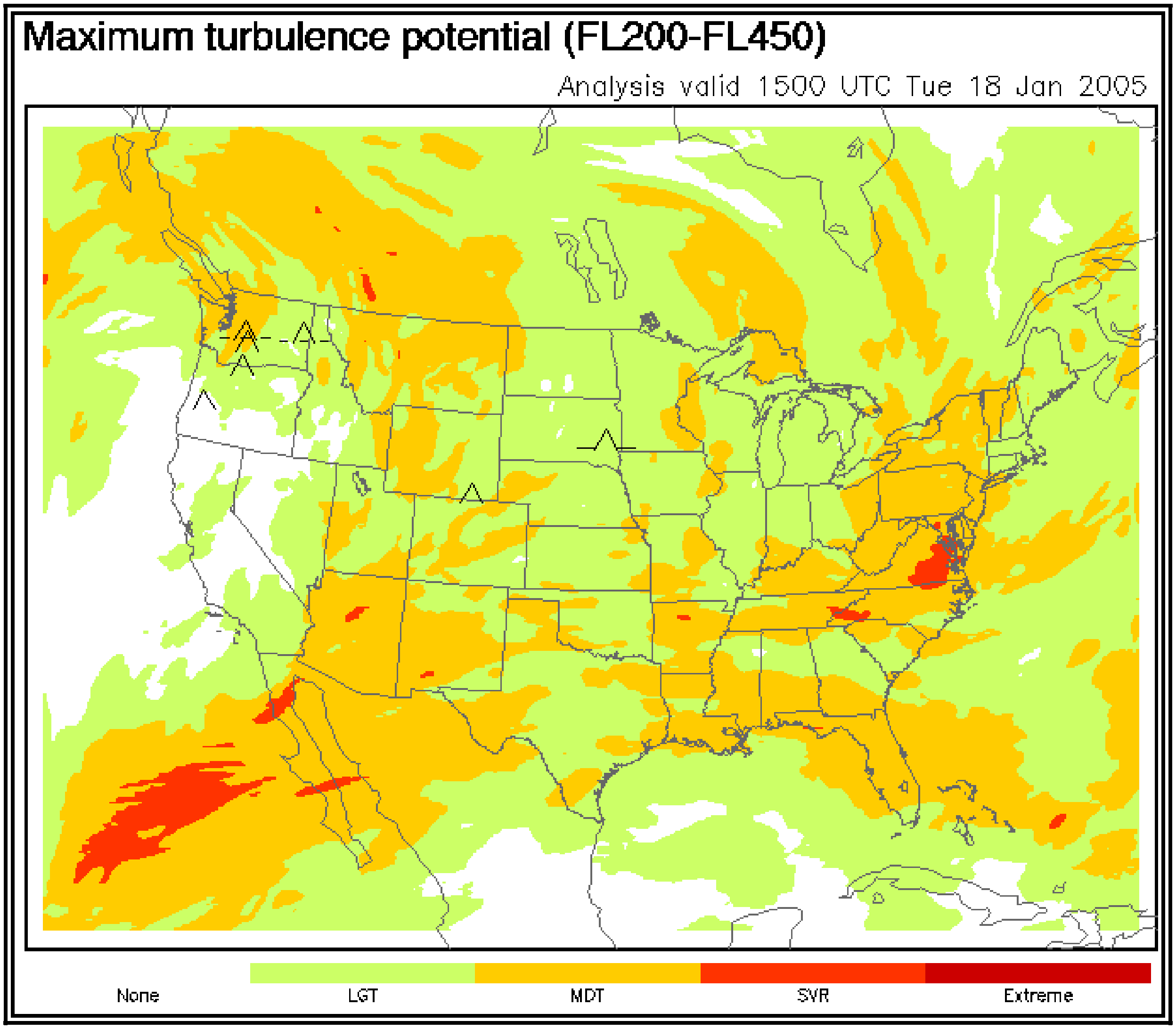

Figure 9-24. GTG Composite Example

9.5.3 Strengths and Limitations

The GTG provides an hourly, high resolution analysis and forecast of clear-air turbulence potential at and above FL200. However, the product is only for turbulence associated with upper level fronts and jet streams while other known causes of turbulence are not forecasted.

Strengths

- The product is issued hourly
- Turbulence is plotted to a high resolution.

Limitations

- The accuracy of the analysis is dependent on the number of PIREPs available. Typically at night fewer pilot reports are received, so the accuracy decreases.

• For the GTG forecast, the product is only as accurate the computer model output used to create them.

• The product only displays clear air turbulence (CAT) for upper-level fronts and the jet stream. Other known causes of turbulence are not included in the product.

• Data and forecast are only available for FL200 and above.

• It is only approved for use by meteorologists and dispatchers.

9.5.4 Use

The Composite product can provide a quick method to determine what the greatest potential of current or forecast turbulence is at a given location. However, to determine the turbulence potential at any given altitude, the individual altitude products must be viewed.

The ADDS web site allows users to overlay turbulence PIREPS on the single altitude graphics. For the PIREP to be plotted on the single altitude product, it must be located within 1,000 feet vertically of the altitude and have been reported within 90 minutes of the chart time. For example, if a user viewed the FL240 GTG product with a valid time of 1400Z the displayed PIREPS could be located between FL230 and FL250 and reported between 1230Z and 1400Z.

9.6 Meteorological Impact Statement (MIS)

A Meteorological Impact Statement (MIS) is an unscheduled flow control and flight operations planning forecast issued by Center Weather Service Units (CWSUs) (Figures 9-21 and 9-22). It is a forecast and briefing product for personnel at Air Route Traffic Control Centers (ARTCCs), Air Traffic Control System Command Center (ATCSCC), Terminal Radar Approach Control Facilities (TRACONS) and Airport Traffic Control Towers (ATCTs) responsible for making flow control-type decisions.

A MIS may be tailored to meet the unique requirements of the host ARTCC. These special requirements will be coordinated between the host ARTCC and the CWSU.

MISs are available on the Aviation Weather Center (AWC) web site at: http://aviationweather.gov/products/cwsu/.

9.6.1 Valid Period

A MIS is valid up to 12 hours after issuance time and details weather conditions expected to adversely impact air traffic flow in the CWSU area of responsibility. The MIS can be immediately effective for existing conditions when CWSU operations begin or for rapidly deteriorating conditions or be effective up to two hours in advance of expected conditions.

9.6.2 MIS Criteria

A MIS enables Air Traffic Control (ATC) facility personnel to include the impact of specific weather conditions in their flow control decision-making. At a minimum, a MIS should be issued when:

- Any of the following conditions occur, are forecast to occur, and, if previously forecast, are no longer expected:
    - Conditions meeting convective SIGMET criteria (Section 5.1.8)
    - Icing - moderate or greater
    - Turbulence - moderate or greater
    - Heavy precipitation
    - Freezing precipitation
    - Conditions at or approaching Low IFR
    - Surface winds/gusts >30 knots
    - Low Level Wind Shear (surface - 2,000 feet)
    - Volcanic ash, dust storms, or sandstorms; and
- In the forecaster's judgment, the conditions listed above, or any others, will adversely impact the flow of air traffic within the ARTCC area of responsibility.

9.6.3 MIS Issuance

MIS phenomena forecasts use the location reference point identifiers depicted on the In-Flight Advisory Plotting Chart (Appendix F), and include the height, extent, and movement of the conditions. MIS product issuances are numbered sequentially beginning at Midnight local time each day. The MIS is disseminated and stored as a "replaceable" product. Therefore, each issuance will contain the details of all pertinent known conditions meeting MIS issuance criteria, including ongoing conditions described in previously issued MISs.

The MIS is for internal use by ARTCC personnel, including Traffic Management Unit (TMU) and TRACON as needed. The MIS is not intended for use by pilots or dispatchers.

9.6.4 Format

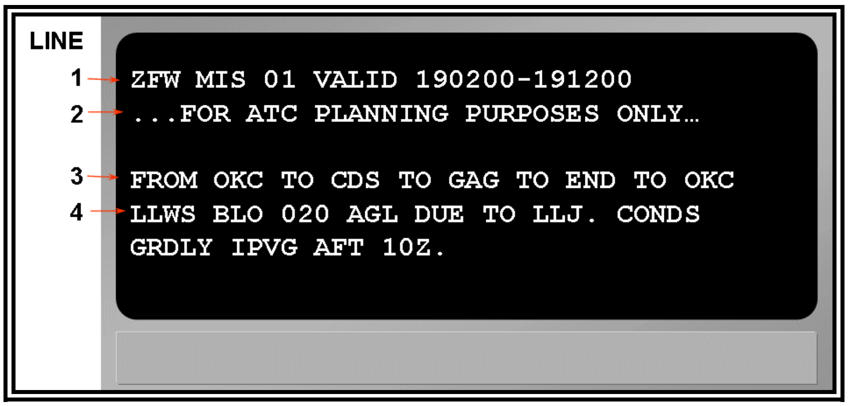

Figure 9-25. Meteorological Impact Statement (MIS) Decoding Example

Table 9-5. Meteorological Impact Statement (MIS) – Decoding

LINE	CONTENT	DESCRIPTION
1	ZFW	ARTCC Identification
	MIS	Product type
	01	Issuance number
	VALID 190200-191200	Valid period UTC date/time
2	…FOR ATC PLANNING PURPOSES ONLY…	Product use statement
3	FROM OKC TO CDS TO GAG TO END TO OKC	Phenomenon location
4	LLWS BLO 020 AGL DUE TO LLJ. CONDS GRDLY IPVG AFT 10Z	Phenomenon description

Any remarks such as “SEE CONVECTIVE SIGMET 8W"; "NO UPDATES AVBL AFT 0230Z"; and forecaster initials and/or facility identifier may be placed at the end of the MIS.

If the phenomenon described in a MIS is no longer expected, a cancellation MIS message may be issued. The FAA header does not contain an issuance number. If the phenomenon described in the MIS is expected to continue beyond the operating hours of the CWSU, then the remark "NO UPDATES AFT ttttZ" (where "ttttZ" is the UTC closing time of the CWSU) is added at the text end.

9.6.5 Examples

ZOA MIS 01 VALID 041415-041900
...FOR ATC PLANNING PURPOSES ONLY...
FOR SFO BAY AREA
BR/FG WITH CEILING BLW 005 AND VIS OCNL BLW 1SM.
ZOA CWSU

Meteorological Impact Statement issued by the Freemont, California CWSU. First MIS issuance of the day, valid from the 4th day of the month at 1415 UTC, to the 4th day of the month at 1900 UTC. For air traffic control planning purposes only. For the San Francisco Bay Area…mist and fog with ceilings below 500 feet MSL and visibility occasionally below 1 statute mile.

ZOA MIS 02 VALID 041650
...FOR ATC PLANNING PURPOSES ONLY...
FOR SFO BAY AREA
CNL ZOA MIS 01. CONDS HAVE IMPRD.
ZOA CWSU

Meteorological Impact Statement issued by the Freemont, California CWSU. The second MIS issuance of the day, valid the 4th day of the month at 1650 UTC. For air traffic control planning purposes only. For the San Francisco Bay Area. Cancel Freemont, California Meteorological Impact Statement number 1. Conditions have improved.

ZID MIS 03 VALID 041200-042330
...FOR ATC PLANNING PURPOSES ONLY...
FROM IND TO 17WSW APE TO LOZ TO 13NE PXV TO IND
TIL 21Z MOD TURB FL310-390 DUE TO JTST WS.
ZID W OF A LINE FM FWA TO BWG
AFT 18Z OCNL SEV TSGR TOPS TO FL450. MOV FM 24035KT. MAX SFC WINDS 60KT.
ZID E OF A LINE FM FWA TO 35SE BKW
MOD MXD ICE IN CLDS/PRECIPITATION 020-120. CONDS ENDING W OF A 40S CLE TO 20NE BKW LINE BY 19Z.
ZID CWSU

Meteorological Impact Statement issued by the Indianapolis, Indiana CWSU. The third MIS issuance of the day, valid from the 4th day of the month at 1200 UTC to the 4th day of the month at 2130 UTC. For air traffic control planning purposes only. From Indianapolis, Indiana to 17 nautical miles west-southwest of Appleton, Ohio to London, Kentucky to 13 nautical miles northeast of Pocket City, Indiana to Indianapolis, Indiana. Until 21Z, moderate turbulence between flight level 310 and flight level 390 due to jet stream wind shear.

For the Indianapolis ARTCC airspace west of a line from Fort Wayne, Indiana to Bowling Green, Kentucky. After 18Z, occasional severe thunderstorms, hail, tops to flight level 450. Moving from 240 degrees at 35 knots. Maximum surface winds 60 knots.

For the Indianapolis, Indiana ARTCC airspace east of a line from Fort Wayne, Indiana to 35 nautical miles southeast of Beckley, West Virginia. Moderate mixed icing in clouds and precipitation between 2,000 feet to 12,000 feet MSL. Conditions ending west of a line from 40 nautical miles south of Cleveland, Ohio to 20 nautical miles northeast of Beckley, West Virginia by 1900Z.

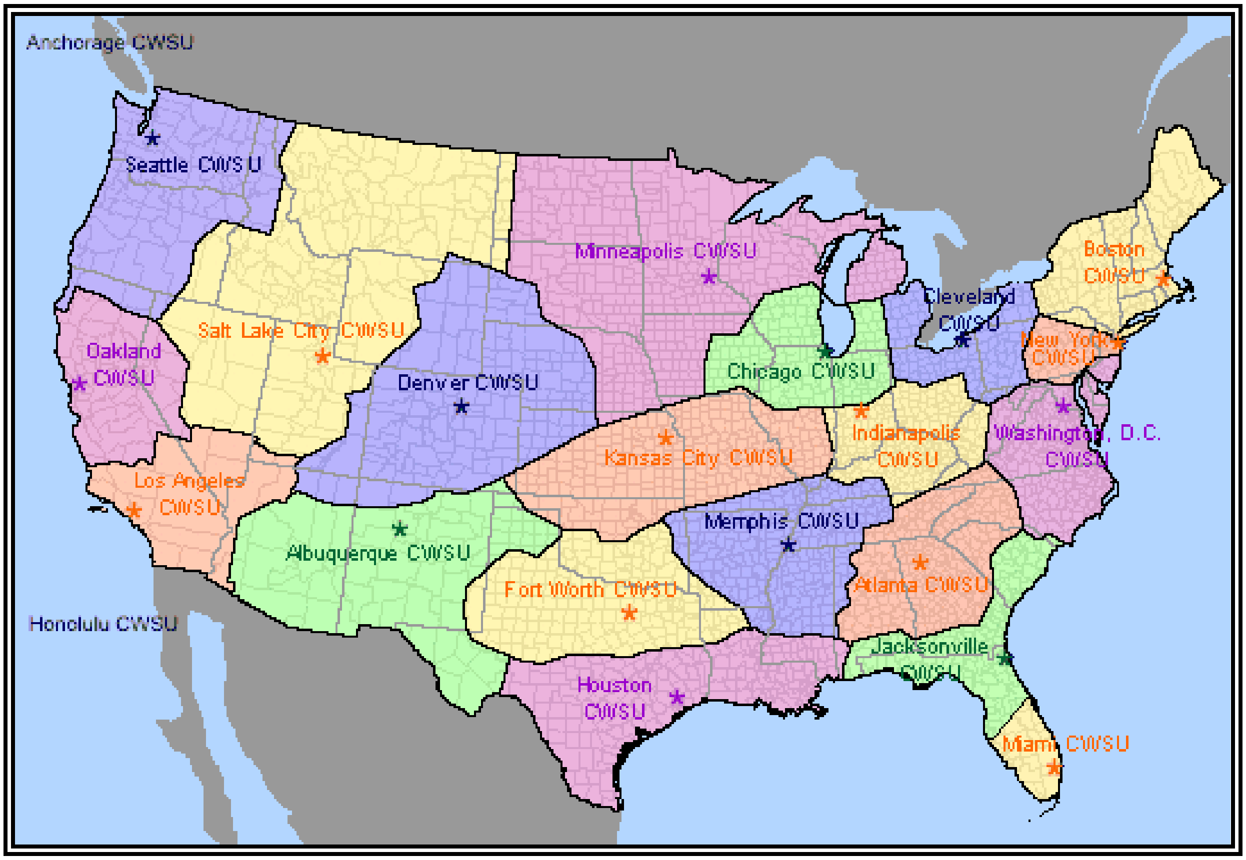

Figure 9-26. Center Weather Service Unit (CWSU) Areas of Responsibility - CONUS

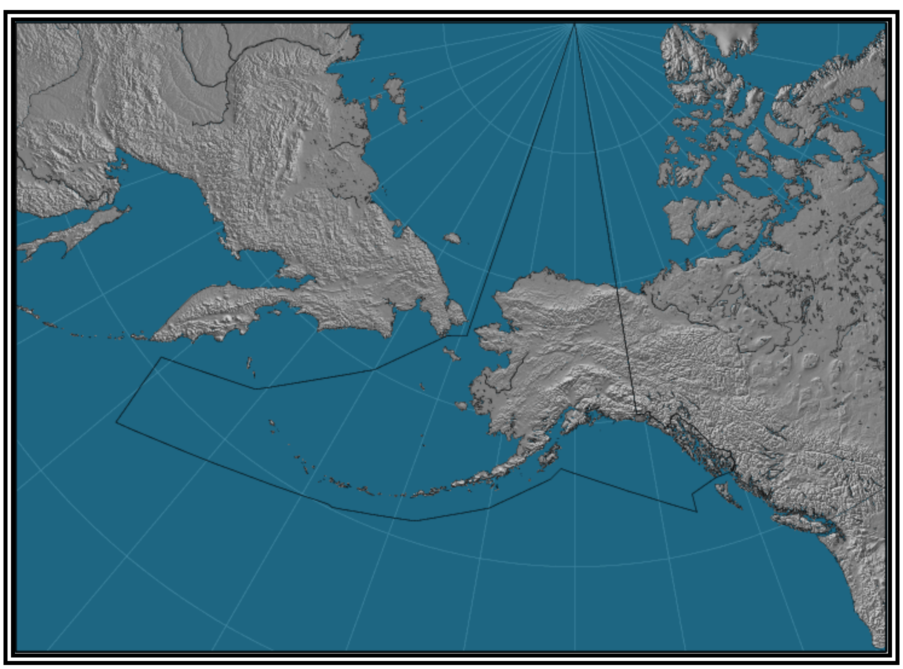

Figure 9-27. CWSU Anchorage, AK (PAZA) Area of Responsibility